Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (previously presented): A method of coating a surface of a titanium based substrate to provide oxidation protection and improved fatigue properties at elevated temperatures, comprising:

applying an aluminum conversion layer to the surface to form a coated substrate, wherein the aluminum conversion layer is applied at a temperature below the melting point of aluminum so that aluminum does not appreciably react with titanium, and wherein the aluminum conversion layer is applied to a thickness of from about 2 to 12 microns; and

heat treating the coated substrate in a two-step process so that:

i) a first portion of the aluminum conversion layer oxidizes to form an alumina layer; and

ii) a second portion of the aluminum conversion layer interacts with the titanium within the titanium based substrate to form titanium aluminide below the alumina layer.

2. (previously presented): The method of Claim 1, wherein the titanium aluminide is formed as a layer having a thickness of from about 2 to 15 microns.

3. (previously presented): The method of Claim 1, wherein the aluminum conversion layer is transformed to the titanium aluminide by heating at a controlled rate above about 500°C followed by a hold at a temperature no more than about 750°C, and cooling at a controlled rate back down to about 500°C.

4. (previously presented): The method of Claim 1, wherein the aluminum conversion layer is applied by gaseous deposition.

5. (original): The method of Claim 4, wherein the gaseous deposition and heat-treating are performed separately.

6. (previously presented): The method of claim 1, wherein the aluminum conversion layer is applied at a temperature below about 300°C.

7-24. (canceled)

25. (previously presented) A method of applying a coating to a brazed substrate comprising:

applying an aluminum conversion layer on a braze of the substrate by gaseous deposition, the layer being deposited at a temperature below the melting point of aluminum so that aluminum does not appreciably react with titanium; and

heat treating the aluminum conversion layer so that the aluminum diffuses into the braze to form a solid solution within the braze, and the aluminum further oxidizes to form an alumina surface layer on the braze.

26. (previously presented): The method of Claim 1, wherein the titanium aluminide comprises the phase $TiAl_3$.

27. (previously presented): The method of Claim 1, wherein the alumina layer has a thickness of from about 0.5 to 5 microns.

28. (canceled)

29. (previously presented): The method of Claim 25, wherein the braze includes titanium, and the aluminum interacts with the titanium to form a layer of titanium aluminide on the braze.

30. (previously presented): A method for forming an oxidation protective coating on a titanium-based substrate, comprising:

a) depositing an aluminum conversion layer on a surface of the titanium-based substrate, wherein the aluminum conversion layer comprises aluminum;

b) oxidizing a first portion of the aluminum to form an outer alumina layer; and

c) reacting a second portion of the aluminum with titanium of the titanium-based substrate to form a layer of titanium aluminide beneath the alumina layer, wherein step b) is performed at a first temperature, and step c) is performed at a second temperature, and wherein the second temperature is higher than the first temperature.

31. (previously presented): The method of Claim 30, wherein the first temperature is about 400° C.

32. (previously presented): The method of Claim 31, wherein the second temperature is about 700° C.

33. (previously presented): The method of Claim 30, wherein step a) is performed at a temperature less than about 550° C.

34. (previously presented): The method of Claim 30, wherein at least one of steps b) and c) is performed in a vacuum furnace.

35. (previously presented): The method of Claim 30, further comprising: prior to step a), cleaning the surface of the titanium-based substrate.

36. (previously presented): A method for forming an oxidation protective coating on a surface of a titanium-based substrate, comprising:

a) depositing an aluminum conversion layer on the surface of the titanium-based substrate;

b) oxidizing a first portion of the aluminum conversion layer to form an outer alumina layer; and

c) diffusing a second portion of the aluminum conversion layer into the titanium-based substrate, wherein a titanium aluminide layer is formed beneath the alumina layer, wherein step b) is performed at a first temperature, step c) is performed at a second temperature, and wherein the second temperature is substantially higher than the first temperature.

37. (previously presented): The method of Claim 36, further comprising:

d) prior to step a), cleaning the surface of the titanium-based substrate with a caustic solution.

38. (previously presented): The method of Claim 36, wherein step b) is performed at a temperature of about 400° C, and step c) is performed at a temperature of about 700° C.

39. (previously presented): A method for forming an oxidation protective coating on a surface of a titanium-based substrate, comprising:

a) depositing an aluminum conversion layer on the surface of the titanium-based substrate, wherein the aluminum conversion layer is deposited at a temperature of less than about 550° C;

b) heat treating the aluminum conversion layer at a controlled rate, wherein the rate is from about 25 to 100° C per hour when the temperature during this step is above 500° C, to form a coated substrate comprising an outer alumina layer and a titanium aluminide layer, wherein the titanium aluminide layer is formed between the titanium-based substrate and the alumina layer; and

c) cooling the coated substrate at a controlled rate, wherein the rate is from about 15 to 60° C per hour, whereby cracking of the titanium aluminide layer is prevented.

40. (canceled):

41. (previously presented): The method of Claim 39, further comprising:

d) prior to step c), holding the temperature attained during step b) for a period of from about 5 minutes to 2 hours.

42. (previously presented): The method of Claim 39, wherein step a) comprises depositing the aluminum conversion layer to a thickness in the range of from about 0.5 to 40 microns, and wherein the titanium aluminide layer is formed to a thickness in the range of from about 1 to 80 microns.

43. (currently amended): A coated titanium-based substrate prepared according to the method of Claim 36, wherein:

the ratio of the stress at which the coated substrate does not fail after 10^6 cycles to the yield strength of the coated substrate is at least about 0.20.

44. (currently amended): An oxidation protective coating for [[~~a~~]] an uncoated titanium-based alloy substrate for forming a coated substrate, the coating comprising:

a layer of titanium aluminide disposed directly on a surface of the titanium-based alloy substrate, wherein the layer of titanium aluminide comprises $TiAl_3$; and

a layer of alumina (Al_2O_3) disposed directly on the layer of titanium aluminide, wherein the layer of alumina has a thickness in the range of from about 0.5 to 5 microns,

and the coating having a uniform thickness, wherein:

the ratio of the stress at which said coated substrate does not fail after 10^6 cycles to the yield strength of said coated substrate is at least about 0.20.

45. (currently amended): The oxidation protective coating of Claim 44, wherein the coating has a thickness of about 10 microns or less, and the yield strength of the coated substrate is similar to the yield strength of the uncoated substrate ~~layer of titanium aluminide has a thickness in the range of from about 1 to 80 microns~~.

46. (currently amended): The oxidation protective coating of Claim 44, wherein the substrate comprises foil having a thickness of about 4 mils and the coated substrate has a yield strength of at least about 140 Ksi ~~layer of titanium aluminide has a thickness in the range of from about 2 to 15 microns~~.

47. (currently amended): The oxidation protective coating of Claim 44, wherein the titanium-based alloy substrate includes a braze disposed on a surface of the titanium-based alloy substrate, the braze comprises titanium, and wherein the oxidation protective coating is formed on the braze, and the yield strength of the coated substrate is similar to the yield strength of the uncoated substrate.

48. (currently amended): A titanium-based component, comprising:

a titanium-based substrate; and

an oxidation protective coating having a uniform thickness disposed on the titanium-based substrate, wherein the oxidation protective coating comprises:

a layer of titanium aluminide disposed directly on a surface of the titanium-based substrate, wherein the layer of titanium aluminide is formed by heating an aluminum conversion layer at a temperature of 700° C or less, and the layer of titanium aluminide comprises $TiAl_3$; and

a layer of alumina (Al_2O_3) disposed directly on the layer of titanium aluminide, wherein the layer of alumina has a thickness in the range of from about 0.5 to 5 microns, wherein:

the ratio of the stress at which said coated substrate does not fail after 10^6 cycles to the yield strength of said coated substrate is at least about 0.20.

49. (previously presented): The titanium-based component of Claim 48, wherein the component comprises a panel of a heat exchanger.

50. (previously presented): The titanium-based component of Claim 48, wherein the component comprises a braze disposed on the titanium-based substrate, the layer of alumina is disposed over the braze, and the braze includes a solid solution of aluminum.